

## Health Care Provider Hemoglobinopathy Fact Sheet

# Hemoglobin E

**Hemoglobin E** is an inherited variant of normal adult hemoglobin (hemoglobin A). It results from a substitution of lysine for glutamic acid in the 26<sup>th</sup> position of the beta ( $\beta$ ) globin chain. This nucleotide abnormality also results in mild thalassemia due to decreased  $\beta$  globin chain production. The gene for Hemoglobin E has the highest frequency among people of Southeast Asian (Cambodian, Laotian, Vietnamese and Thai) heritage. However, it is also found in people of Chinese, Filipino, Asiatic Indian, and Turkish descent. Summarized below are the four most commonly encountered hemoglobin patterns that involve hemoglobin E.

### Hemoglobin E Trait (phenotype: FAE in infants and AE in adults)

Hemoglobin E trait results when the gene for hemoglobin E is inherited from one parent and a hemoglobin A gene from the other. This carrier state does not usually result in health problems, although there may be a low MCV and target cells. For an infant identified with hemoglobin E trait on two newborn screening specimens, no further testing is indicated for the child. However, it is strongly recommended that the parents have hemoglobin testing to determine if they may be at risk for having subsequent children with hemoglobin E/ $\beta$  thalassemia or hemoglobin sickle E disease, clinically significant diseases (described below), which are inherited in an autosomal recessive fashion.

### Homozygous Hemoglobin E (phenotype: FEE in infants and EE in adults)

Homozygous hemoglobin E results when the gene for hemoglobin E is inherited from both parents. A mild thalassemia phenotype develops in the first few months of life as the amount of fetal hemoglobin decreases and hemoglobin E increases. Splenomegaly and other complications can occur but in general it is considered a benign condition. Also, because the red blood cell indices are abnormal in homozygous hemoglobin E disease, iron deficiency, if suspected, may need to be assessed more directly through serum iron levels, iron binding capacity, and percent saturation.

### Hemoglobin Sickle E Disease (phenotype: FSE in infants and SE in adults)

Compound heterozygotes with hemoglobin sickle E disease result when the gene for hemoglobin E is inherited from one parent and the gene for hemoglobin S (commonly known as sickle cell) from the other. A mild to moderate hemolytic anemia develops in the first few months of life as the amount of fetal hemoglobin decreases and hemoglobin S and E increases. Although a form of sickle cell disease, most individuals with hemoglobin sickle E disease have fewer problems with infections and spleen involvement, fewer pain episodes and less organ damage than the other more common forms of sickle cell disease.

### Hemoglobin E/ $\beta$ Thalassemia (phenotype: FEA or FE<sup>-</sup> in infants and EA or E<sup>-</sup> in adults)

Co-inheritance of the gene for hemoglobin E and  $\beta$  thalassemia, termed hemoglobin E/ $\beta$  thalassemia, has clinical manifestations ranging from moderate to severe, depending upon the degree of the thalassemia affecting the hemoglobin A gene. Individuals with hemoglobin E/ $\beta^0$  thalassemia have a severe hemolytic anemia marked by splenomegaly, jaundice, and expansion of marrow space. Occasional or chronic transfusions are often required. Most individuals with hemoglobin E/ $\beta^+$  thalassemia have a moderate anemia marked by splenomegaly and jaundice.

*Genetic counseling is advisable for families affected by these conditions to promote understanding of the significance for themselves and future offspring. A list of genetic counselors and hemoglobin consultants was included with this fact sheet (additional copies are available from our office).*

